LHC Theory Initiative

Jonathan Bagger
Presentation to HEPAP

http://www.pas.rochester.edu/~orr/LHC-TI.html
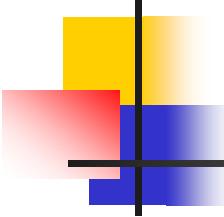
LHC is coming …

- **There is important theoretical work to be done before the LHC experiments start producing physics**

    - Accurate theoretical predictions are necessary for the LHC experiments to realize their full potential

    - It is crucial to understand both signals *and* backgrounds

- **Time is short …**
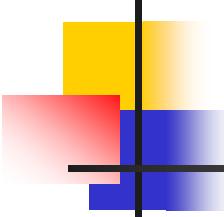
LHC Theory Initiative

- **A prestigious Fellowship program**

  - Composed of postdocs, students and (perhaps) junior faculty

  - Modeled on the very successful Hubble Fellowship program in Astronomy and on the SSC Fellowship program in particle physics

  - Aimed at creating a vibrant, networked community of theorists working on physics directly relevant to the LHC
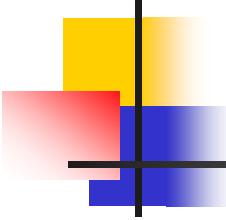
LHC Theory Initiative

- **A new way of approaching theory**

  - A virtual institute using collaborative tools to focus effort on LHC theory

  - A network of working groups to identify, prioritize and solve the most pressing problems for LHC theory

  - A Fellowship program to build an LHC theory community
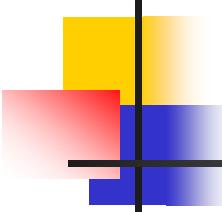
Steering Committee

- ## Community-based organization

Paul Langacker [Chair] (Penn)

|	
Jonathan Bagger (JHU)	Steve Mrenna (FNAL)
Ulrich Baur (SUNY Buffalo)	Fred Olness (SMU)
R. Sekhar Chivukula (MSU)	Lynne Orr (Rochester)
Sarah Eno (Maryland)	John Parsons (Columbia)
Walter Giele (FNAL)	Martin Schmaltz (Boston)
JoAnne Hewett (SLAC)	Carlos Wagner (ANL and Chicago)
Ian Hinchliffe (LBNL)	Edward Witten (IAS, Princeton)
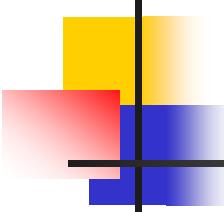
NSF Proposal

- **Intellectual merit: Provide calculational tools and theoretical results necessary for LHC physics**

    - Compute higher-order QCD and electroweak corrections in the SM, supersymmetric theories, and other beyond-the-SM models
    - Develop robust and well-tested Monte Carlo tools to confront with data various theoretical models

- **Broader impact: Create the nucleus of a vital US LHC theory community**

    - Facilitate the development in the US of a world-class community in collider theory
   - Extract full value from the investment made to date in the LHC
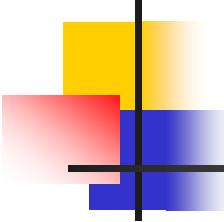
Priorities

- ## The highest-priority SM calculations

  - Improving parton distribution functions, including next-to-next-to-leading order effects, with reduced uncertainties

  - Improving calculations of QCD processes such as multijet production that will be used as calibration tools for the detectors

  - Calculating more precise and reliable background processes that are relevant for the Higgs search, including ttj, ttbb, ttjj and WWjj production
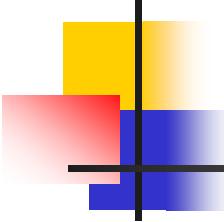
Priorities

- ## The highest-priority signal calculations

  - Implementing new physics scenarios in Monte Carlo event generators

  - Investigating how the different models can be distinguished in LHC experiments

  - Finding ways to determine the basic properties of new particles, such as couplings, spins or electric charges
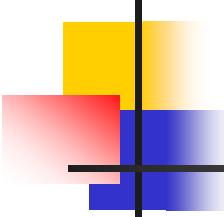
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- ## Status

  - FY2006 proposal declined. Strong support for concept
    - ~ $900k per year

  - FY2007 proposal being prepared. Encouragement from community and from NSF

  - Initial steps underway – organizing network and working groups

  - Input still being sought. Send comments and suggestions!
    - Junior faculty?
    - How best to ensure strong and effective linkage to ATLAS and CMS?